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# Pathway to a GREEN Energy Future

***Economic Renewable Energy  
Generation & Education  
Program at / for Our Nation's Schools***



# *Hands-on Energy Education*

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- Onsite clean, green, renewable energy educational experience
- Experience firsthand the benefits of pursuing a cleaner, sustainable, “GREEN Energy Future”
- Create K-20 educational curriculum
- Attract scholarships for our children to pursue higher education and careers in energy
- Stimulate discovery of technology advancements



## *Initiative*

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Provide economic onsite renewable energy generation technologies at school facilities for a firsthand learning experience to stimulate discovery of technology advancements by our youth for a **GREEN Energy Future**



# *Program*

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A collaborative effort between  
renewable energy technology  
providers, developers, marketers,  
and Green Energy Advocates



# *Some of the Participants*

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Society of Manufacturing Engineers

[www.sme.org](http://www.sme.org)

Association of Energy Engineers

[www.aeecenter.org](http://www.aeecenter.org)

American Council on Renewable Energy

[www.acore.org](http://www.acore.org)

MTI Energy Management

[www.mti-energy.com](http://www.mti-energy.com)

Michigan GREEN

[www.michigangreen.org](http://www.michigangreen.org)

Acela Energy

[www.abelaenergy.com](http://www.abelaenergy.com)

Sterling Planet, Inc

[www.sterlingplanet.com](http://www.sterlingplanet.com)

Partners GREEN LLC

[www.partnersgreen.org](http://www.partnersgreen.org)



# *Technology Companies*

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WindStor Power Co.

[www.mckenziebay.com](http://www.mckenziebay.com)

Developer of innovative onsite generation wind turbine

Cobasys LLC

[www.cobasys.com](http://www.cobasys.com)

Advanced nickel metal hydride batteries

United Solar Ovonic LLC

[www.uni-solar.com](http://www.uni-solar.com)

Developer of innovative photo-voltaic technology



# *Michigan GREEN*

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Michigan GREEN

[www.michigangreen.org](http://www.michigangreen.org)

Representing more than 60 Michigan organizations

Sterling Planet Inc

[www.sterlingplanet.com](http://www.sterlingplanet.com)

Leading marketer of Renewable Energy Certificates

Partners GREEN LLC

[www.partnersgreen.org](http://www.partnersgreen.org)

Developer/owner of onsite renewable energy systems



# *Education Curriculum*

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## **Michigan GREEN**

- Collaboration of more than 60 Michigan based companies, organizations, government agencies, school, universities & colleges
- Spearheading the development of a hands-on renewable energy generation & energy efficiency education curriculum
- Field study projects of all renewable energy generation technologies and energy efficiency devices installed on school grounds





# *Program Illustration*

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***Partners GREEN***

***Michigan GREEN***

***WindStor®***

***Sterling Planet***

***Green Energy Advocates***

# *Energy Technology - WindStor®*

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*A wind energy system  
that generates and  
distributes electricity  
at & for urban and off-  
grid locations with a  
US Patented vertical  
axis WindStor® wind  
turbine and a  
proprietary System  
Integrator*



# *WindStor<sup>®</sup> Wind Turbine Design Specifications*

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**US Patent # 6,979,170**

**Additional Patents Pending**

## **Rotor**

- Height: 24 m, 79 ft
- Diameter: 26 m, 86 ft
- Swept area:  $\sim 383 \text{ m}^2$
- Number of blades: 3
- RPM @ rated wind speed: 50
- Speed @ blade equator – Max: 68 m/s, 152 mph

## **Blades**

- Length: 36 m, 118 ft
- Chord: 600 mm
- Material: Steel reinforced composite coated



# *WindStor® Wind Turbine Design Specifications*

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**US Patent # 6,979,170**

**Additional Patents Pending**

## **Generator**

- 200 kW name plate rated
- Type: Direct drive permanent magnet variable speed
- Voltage: 400V / 480V
- Frequency: 50 Hz / 60 Hz

## **Tower**

- Self supporting tower: Steel member lattice work
- Height range: 18-34 m, 60-112 ft
- Base footprint: ~ 4-6 m, 12-20 ft



# *WindStor® Wind Turbine Design Specifications*

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**US Patent # 6,979,170**

**Additional Patents Pending**

## **Safety**

- Active & dynamic monitoring
- Multiple independent braking devices
- Compliance with IEC 61400 standards
- Minimal maintenance / annual inspection
- Automatic shutdown - vibration sensors
- Slower blade equator tip speed:
  - - Reduced operating noise
  - - Lessens chances for bird strikes



# *WindStor® Wind Turbine Design Specifications*

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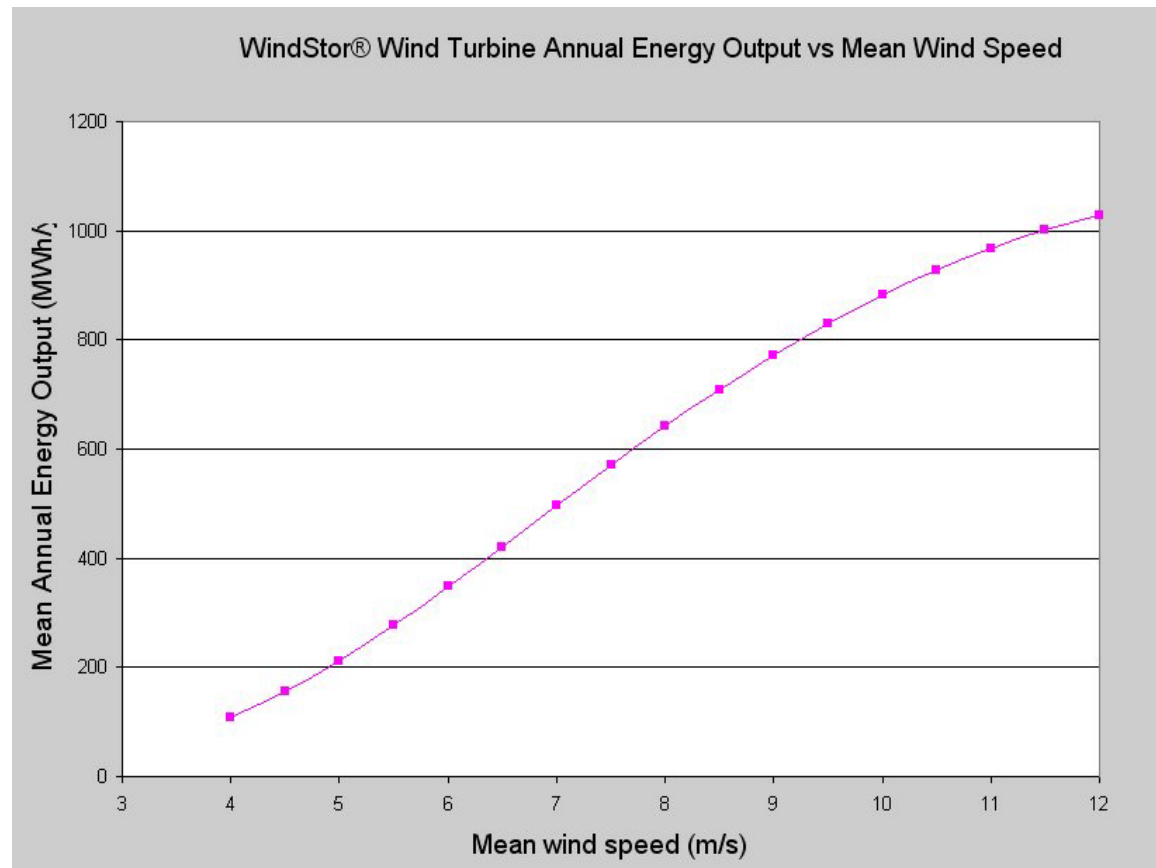
## **Performance Parameters**

- Rated Power: 200 kWh @ 12 m/s
- Variable Speed Operating Range: 20-50 rpm
- Rated operating temperature: -40° / +50° C,  
-76° / +122° F
- Design Life: +20 years
- Design Standards: IEC 61400; IEEE1547
- Peak Survival Winds: 60 m/s, 15 mph
- Power Production - Annual:
  - Wind Regime: 7.5 m/s, ~15 mph
  - Capacity Average: 27-31%
  - Availability: 95%
  - 500,000 kWh

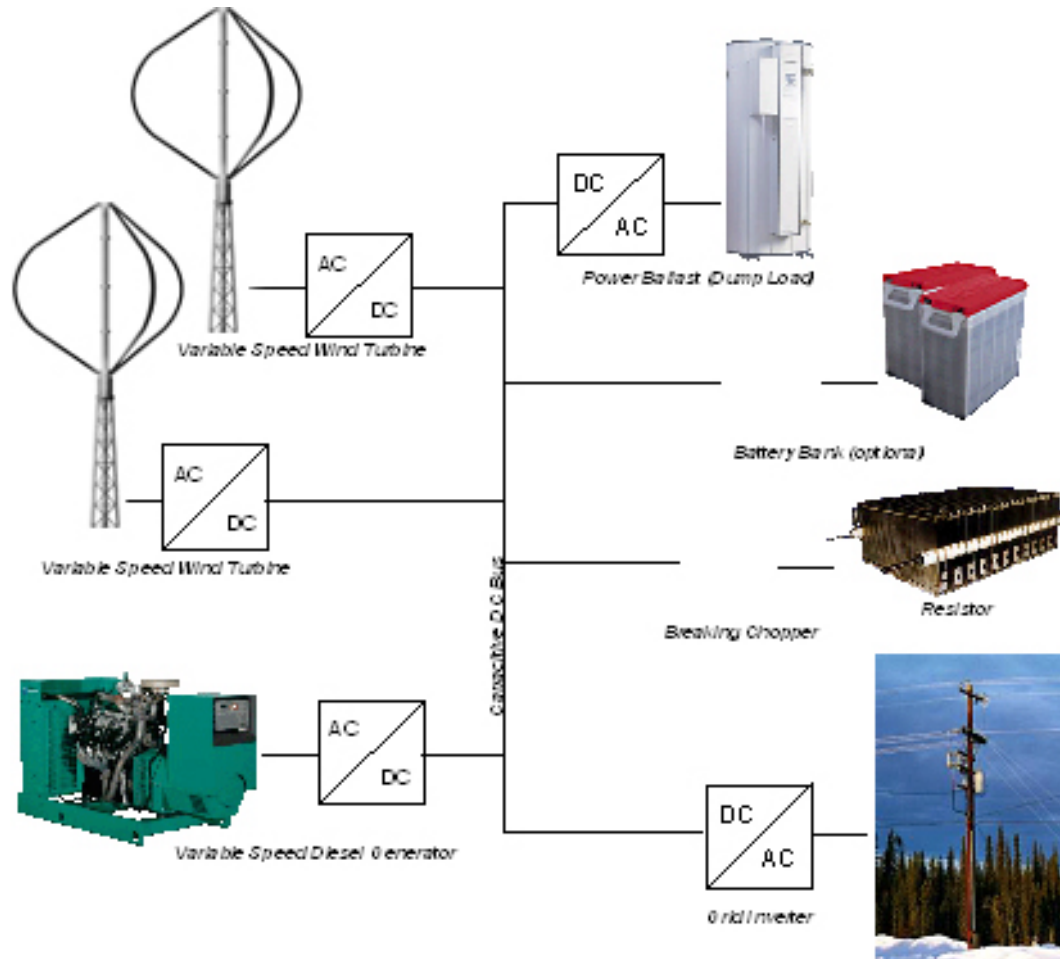


# *WindStor<sup>®</sup> Power Curve*

## Expected Gross Output Prior to System Losses



# WindStor Proprietary System Integrator



## System Control And Data Acquisition System “SCADA”

- dual AC/DC/AC conversion supplies grid quality power
- accepts multiple power inputs
- automatically selects pre-defined power sources
- manages quality and power production
- communicates with individual turbine controllers
- sets and manages a safe power reserve
- simultaneously acquires and transmits data





# *Economic Challenge Solution*

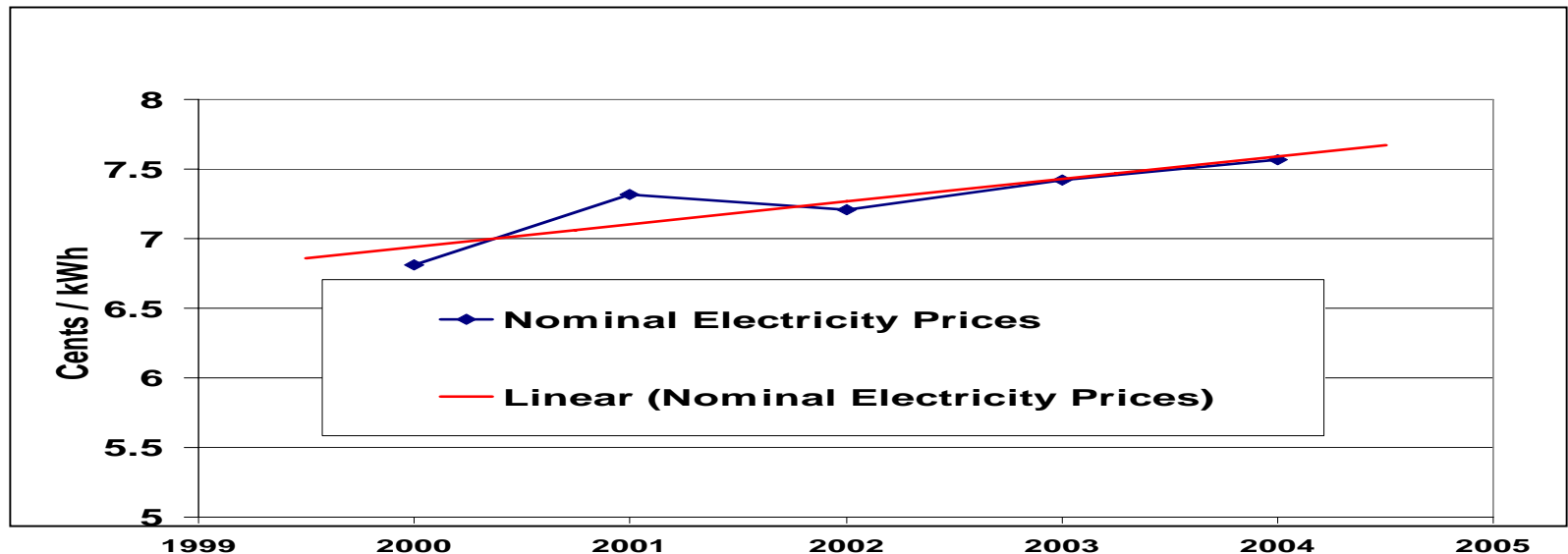
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## **Partners GREEN LLC**

- Owns, installs, maintains & operates energy generation devices & sells electricity at / for the customer's facility
- Customer choice of energy rate
- Long-Term fixed rates
- Hedge against rate increases
- Potential to lower existing energy costs
- Capital expenditure not required
- Without operating cost or risk

# *Historical Electric Rate Increases*

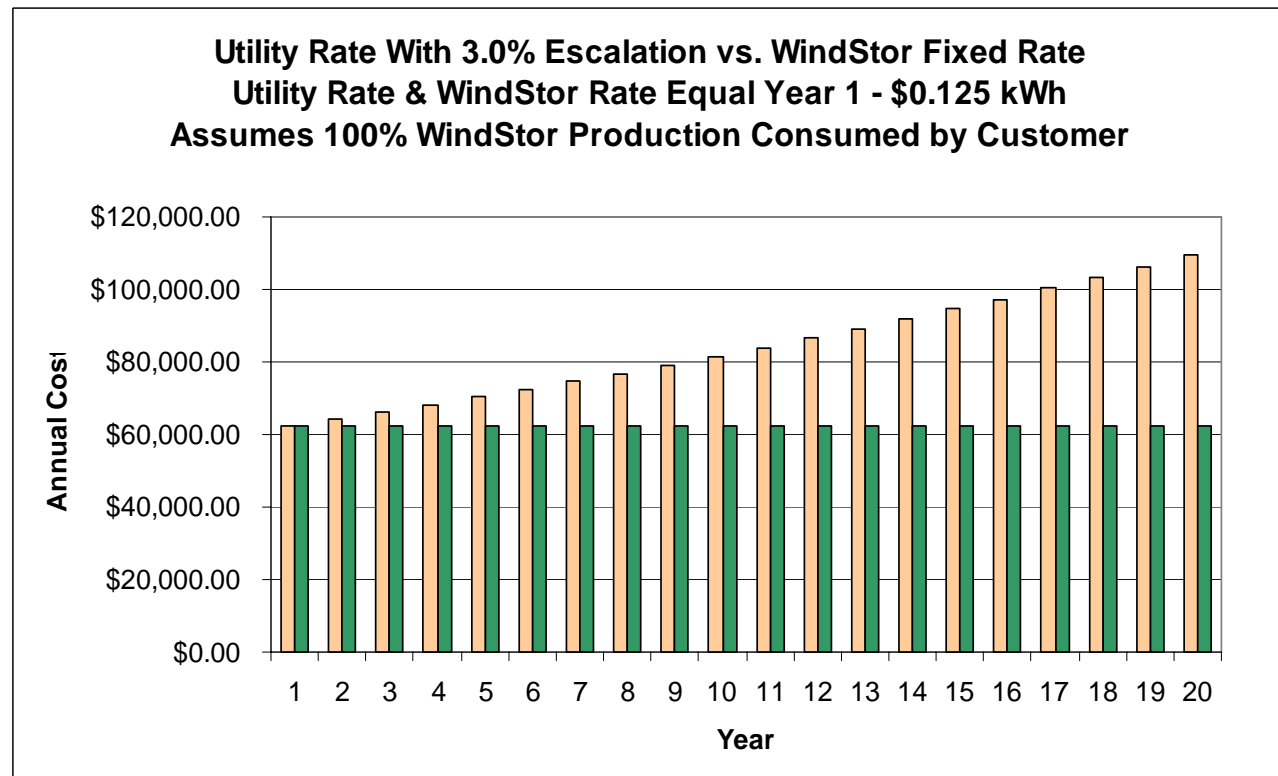
- 1985 – 2000: Average Electric Costs increased at an average annual rate of 3.2 %\*
- 2000 – 2004: Average Electric Costs increased at an average annual rate of 16.2%\*



\* *Extrapolated from 2004 Annual Energy Review - EIA*

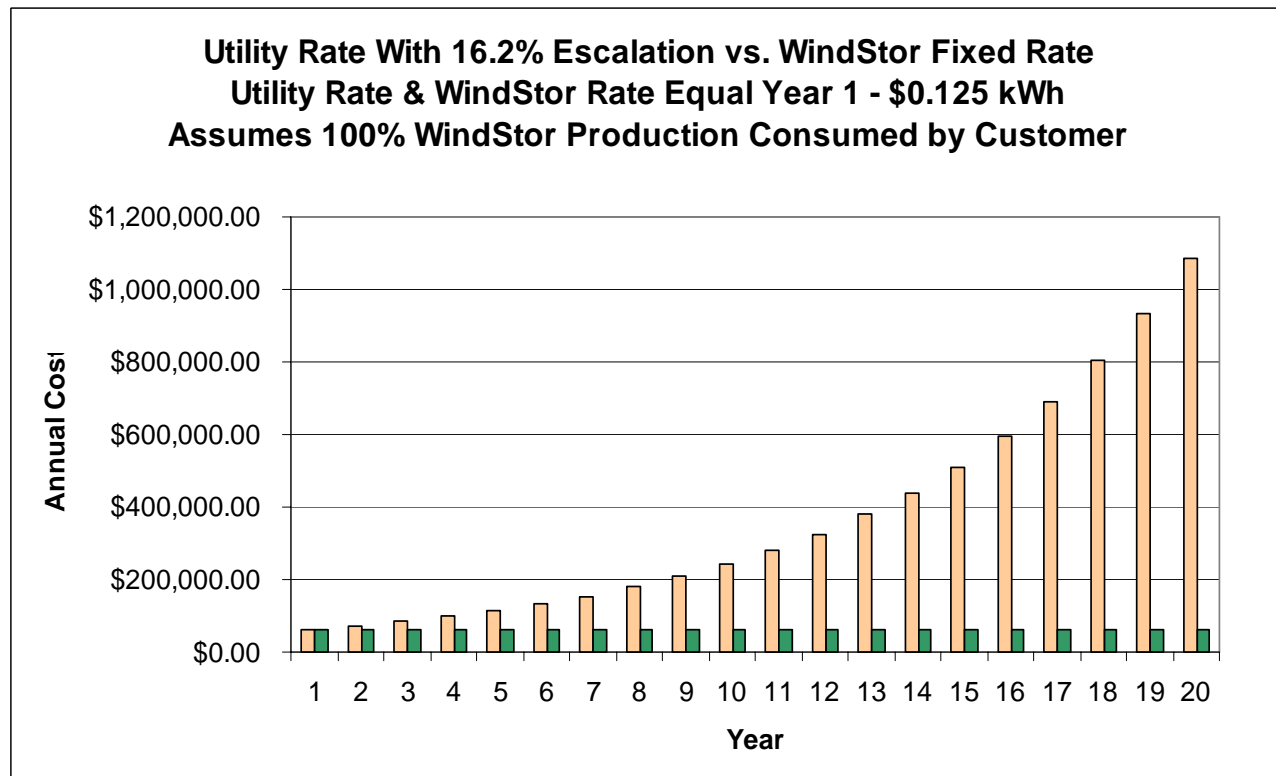
# *Partners GREEN - Grid Comparison*

**Twenty Year Comparison – Rates Equal Year 1  
Cumulative Partners GREEN Advantage \$429,398**



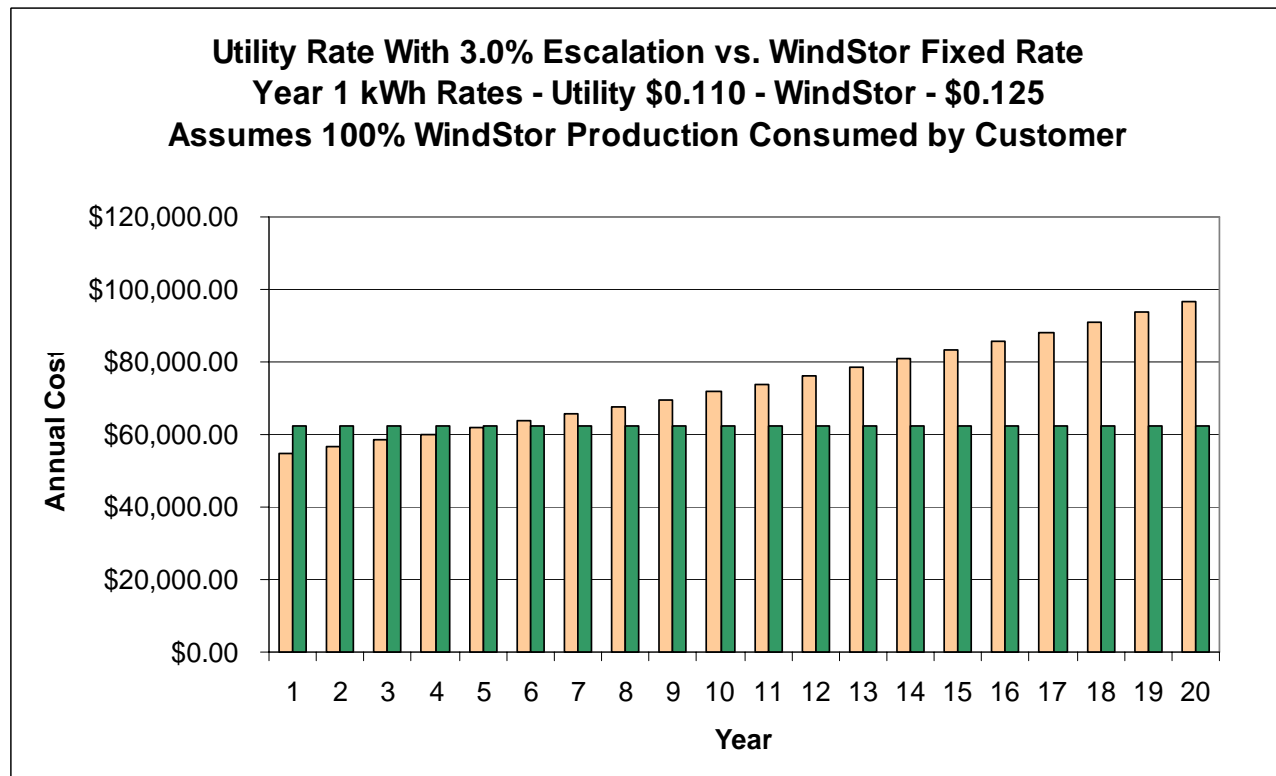
# *Partners GREEN - Grid Comparison*

**Twenty Year Comparison – Rates Equal Year 1  
Cumulative Partners GREEN Advantage \$6,135,388**



# Partners GREEN – Grid Comparison

## Twenty Year Comparison – Utility Rate Lower Year 1 Cumulative Partners GREEN Advantage \$227,870





# *Economic Choices*

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## Long-term - WindStor Base Rate Reduction

Offset a portion of the installation cost with:

- Non-refundable grants
- Donor contributions
- Bond Funding

## Annual Cost Reduction

Green Energy Advocates purchasing Renewable Energy Certificates “Green Tags” at price premiums to cost providing a profit to offset the cost of WindStor provided energy



# *Annual Cost Reduction – Green Tags*

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Sterling Planet and Partners GREEN joined forces and agreed to distribute the profits from the sale of WindStor<sup>®</sup> generated Renewable Energy Certificates “RECs” known as Green Tags to the school

- The school will receive a profit of \$0.07/kWh to offset WindStor energy costs
- Annual profit to offset WindStor cost could equal ~ \$35,000 for each *WindStor*<sup>®</sup> Wind Turbine

# *Environment – Air Emissions*

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A Single *WindStor*® Wind Turbine  
Annually Producing 500,000 kWh

Pollutions Displaced - Annual

633,860 Pounds of Carbon Dioxide (CO<sup>2</sup>)

3,435 Pounds of Sulphur Dioxide (SO<sup>2</sup>)

2,105 Pounds of Nitrogen Oxides (NO<sup>x</sup>)

Equivalent Environmental Impact - Annual

Removing 42 autos from the road, or

Planting 86.8 acres of trees

(Compared to U.S. average utility generation fuel mix)







# *Green Energy Advocate Action List*

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- Inform your school district that you want the Program at the school for your children and grandchildren
- Make a donation to help bring the Program to your school
- Instruct your elected officials to pass regulations that remove barriers to entry
- Encourage others to participate
- Purchase Renewable Energy Certificates
- Issue a Non-Refundable Grant



# *Green Energy Advocate Benefits*

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- Recognition of the contribution with site signage
- *Certificate of Environmental Stewardship*
- Potential income tax deduction for qualified donors
- Knowledge that their donation provides their school and future generations a meaningful, long-lasting, ***GREEN Energy Future***



# *Conclusion*

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The Program answers the economic and educational challenges by uniting everyone in a collaborative effort to develop and deploy innovative business strategies for innovative technologies. Ultimately, thanks to a hands-on learning experience, our youth will reward us with future discoveries of technologies for a cleaner, sustainable, **GREEN Energy Future**

Partners GREEN LLC – 810-220-5948 - [www.partnersgreen.org](http://www.partnersgreen.org)

MTI Energy Management – 248-446-9502 - [www.mti-energy.com](http://www.mti-energy.com)

Acela Energy – 781-255-0316 – [www.acelaenergy.com](http://www.acelaenergy.com)

Sterling Planet – 877-457-2306 – [www.sterlingplanet.com](http://www.sterlingplanet.com)